

REMARKS

This is in response to the Office Action dated December 14, 2006. In view of the following representations, reconsideration is respectfully requested.

On pages 2-5 of the Office Action, claims 1-5, 7-12 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schaming (U.S. Patent No. 4,365,758).

Claim 1 requires, *inter alia*, a descaling nozzle having a nozzle orifice comprising:
a tapered segment extending towards the upstream side from said discharge orifice with a taper angle θ of 30 to 80°; and
a ratio (D_1/D_2) of the inner diameter D_1 of a large-diameter segment relative to a minor diameter D_2 of said discharge orifice that is not less than 3.

In the "Response to Arguments" section of the Office Action, the Examiner notes that the Schaming reference does not indicate the drawing scale and includes the typical boilerplate language at the conclusion of the specification. Based on this, the Examiner apparently concludes any specifics, such as the taper angle and ratio recited in claim 1, would have been obvious. The Examiner is requested to cite the authority for such a position.

On page 3 of the Office Action, the Examiner acknowledges that Schaming "does not teach the taper angle being between 30° to 80°, nor is a definitive diameter of the large segment in regards to the minor diameter of the nozzle orifice mentioned." The Examiner then states:

"However, in light of the compared Fig. 2 versus Fig. 2 of the instant application, it would appear to be well within the scope of one having ordinary skill in the art at the time the invention was made understood [sic] the tapered segment to have an angle of 30° to 80°, or even 40° to 60°, and to have compared the minor diameter of the elliptical discharge orifice and the major diameter of the larger segment above the tapered area and derive a number not less than 3, but less than 7, or less than 6 in order to optimize spraying in a descaling nozzle."

What does the Examiner's comparison of the respective figures have to do with the conclusion of obviousness? Based on a careful comparison of the figures, one

could only conclude that the Schaming reference does not meet each and every limitation of claim 1. Clearly Fig. 2 of Schaming does not disclose the specific range of the taper angle or the ratio of the inner diameter of the large-diameter segment relative to the minor diameter of the discharge orifice as specified in claim 1.

Furthermore, it is undisputed that the Schaming reference does not discuss the technical meaning of a nozzle configuration (or the ratio D_1/D_2) including an orifice in relation to efficient scale removal. This is apparent from the fact that the novel feature of the cited reference resides in the tapering conical entrance venture passage 18. Clearly, Schaming fails to disclose or teach that the nozzle configuration differences represented by the ratio D_1/D_2 remarkably affect the descaling efficacy even at a low pressure/ low flow rate.

Further, on page 4 of the Office Action, the Examiner recites case law which states that discovering optimal values of a result effective variable involves only routine skilled in the art. However, the Examiner has not established that the ratio of the inner diameter of the large-diameter segment to the minor diameter of the discharge orifice is recognized in the prior art as a result effective variable. Applicant made this very specific argument in the last response, and the Examiner did not respond by explaining the basis for the position that the claimed ratio is “recognized” as a result-effective variable. See page 22 of the previous response for the detailed argument. Accordingly, the Applicant requests that the Examiner respond to this argument at least so that Applicant can judge the advisability of an appeal. As previously noted, in the case law cited by the Examiner, the Court found that the prior art suggested that the proportional balances could be alternated to achieve the desired results. In this case, as acknowledged by the Examiner, the prior does not recognize the importance of the inner diameter of the large-diameter segment in relation to the minor diameter of the discharge orifice.

Further, Applicant respectfully requests that the Examiner reconsider the arguments presented on pages 20-21 of the previous response because Applicant does not contend that the Schaming drawings are to any particular scale. However, it is

appropriate to determine the relative relationships between the various parts by observing the drawings. Accordingly, the specific scale is irrelevant because Applicant is not relying on any particular dimensions of the Schaming nozzle but rather on the ratio shown in Fig. 2 of Schaming. As indicated in the previous response, the Schaming nozzle does not meet the requirements of the ratio required in claim 1.

Further, the specific ratio (D_1/D_2) cannot simply be dismissed as an obvious design choice because the present invention produces unexpected results over the prior art nozzle due to the particular ratio (D_1/D_2). In particular, the descaling nozzle of the present invention provides unexpected results in comparison with the nozzle of the cited reference. The Applicant prepared a nozzle corresponding to Fig. 2 of the Schaming reference ($D_1/D_2=1.9$) and compared it with a nozzle constructed in accordance with the present invention ($D_1/D_2=3.6$). The aluminum (Al) erosion amount in terms of 30 seconds was determined for aluminum of JIS-5050 under the following conditions.

- a jetting pressure (water pressure): 15 MPa

- a discharge flow rate: 180 l/minute

- a spray distance: 150 mm

- an aluminum erosion time: 900 seconds

As a result of the experiment, the nozzle of the present invention produced an aluminum (Al) erosion amount (in 30 seconds) of 0.045 g, while the prior art nozzle produced an aluminum (Al) erosion amount (in 30 seconds) of 0.003 g. Thus, with respect to the erosion amount, it is apparent that the nozzle of the present invention produced remarkably improved results. If necessary, Applicant will submit the experimental data for the Examiner's consideration.

As further evidence of nonobviousness and that the present invention is a significant advance in the relevant technology, Applicant received a prize from the chief of Resources and Energy of the Japanese Government Office.

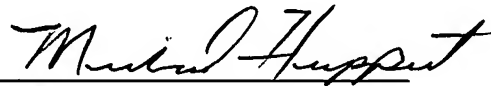
Further, the nozzle of the present invention was presented at the society under sponsorship of AIST (The Iron & Steel Technology Conference and Exposition,

AlSTeck 2006). Attached hereto is a copy of the presentation.

In the event that the Examiner has any comments or suggestions of a nature necessary to place this case in condition for allowance, then the Examiner is requested to contact Applicant's undersigned attorney by telephone to promptly resolve any remaining matters.

Respectfully submitted,

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March 29, 2007